

R E M A R K S

The Examiner objects to the drawings as failing to show the arrangement of the ridges and channels. Applicant submits proposed new drawing Figures 5, 6 and 7.

Fig. 5 shows a portion of the heat exchanger with ridges, viewed from above, two marked in red, with a corresponding valley between. On the other side of the fold line, the continuing ridge is shown marked in purple. When folded in the assembled position, the ridges fold at the points where the red and the purple intersect. The black lines represent regions where the bottom of each valley are farthest from each other.

Fig. 7 shows a section of Fig. 5, with the ridge peaks shown in red.

It is hoped that this representation will help make clear to the Examiner the claimed features relating to the ridge/channel pattern, and how this results in the novel flow and heat transfer characteristics.

The Examiner rejects Claims 5 and 9 under 35 USC § 103(a) in view of the Russian ACV reference and *Usher*.

Applicant now encloses an English language copy of the ACV reference. From this it can be clearly seen that there is no discussion of the references or configuration of the corrugations. The invention there is directed to paper impregnated with thermo-plastic resins.

Regarding *Usher*, the Examiner "resurrects" this reference. However, for the reasons pointed out in our Response dated April 20, 1999, which successfully removed this reference, the reference is not appropriately cited to teach the pattern of the presently claimed invention.

Claims 7, 8, 10 and 11 have been rejected under 35 USC § 103(a) in view of ACV, *Usher* and *Hultgren*.

Reference is now made once again to our arguments against *Usher* in the April 20, 1999 Response, and against ACV and *Hultgren* in the October 4, 2001 Response.

Regarding the Examiner's comment that the applicant has been amending the angles to merely overcome the cited art, it is noted that because of the relative complexity of claiming the three dimensional shapes of the invention, some of the previous claims, as a result of a lack of clarity and the translation from the original Swedish claims, may have presented the appearance of inconsistency to the Examiner. However, it is believed that the present state of the claims is clear to the Examiner.

It seems that the Examiner has taken the position that the carefully engineered structure of the present invention is simply present in the art he continues to cite, despite no discussion of the flow and heat transfer characteristics, which motivated the present invention,

HEED, Bjorn  
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that art. It is asserted that the Examiner fails to appreciate the significance of the presently claimed invention as a whole, including the unique ridge/channel pattern together with the folded structure and the resultant thermally balanced flow of heat exchange fluids.

It is hereby again asserted that no reference alone, or combination of references, discloses the presently claimed invention.

Applicant respectfully requests that the Examiner carefully review his position, and withdraw the objections.

Applicant asserts that all of the objections have been obviated and, therefore now respectfully requests withdrawal of the objections, and allowance of the application.

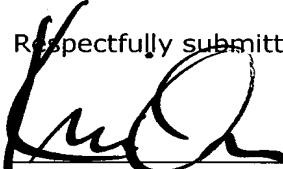
**REQUEST FOR EXTENSION OF THE TERM**

Applicant respectfully requests an extension of the normal term which expired on May 25, 2003, for three months, to August 25, 2003.

Submitted herewith is a check for \$465.00 to cover the cost of the extension.

Any deficiency or overpayment should be charged or credited to Deposit Account Number 04-2219, referencing our Docket Number 5098.

Respectfully submitted,



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**CERTIFICATE OF MAILING**

*I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on August 25, 2003.*



Nadia Nalywajko

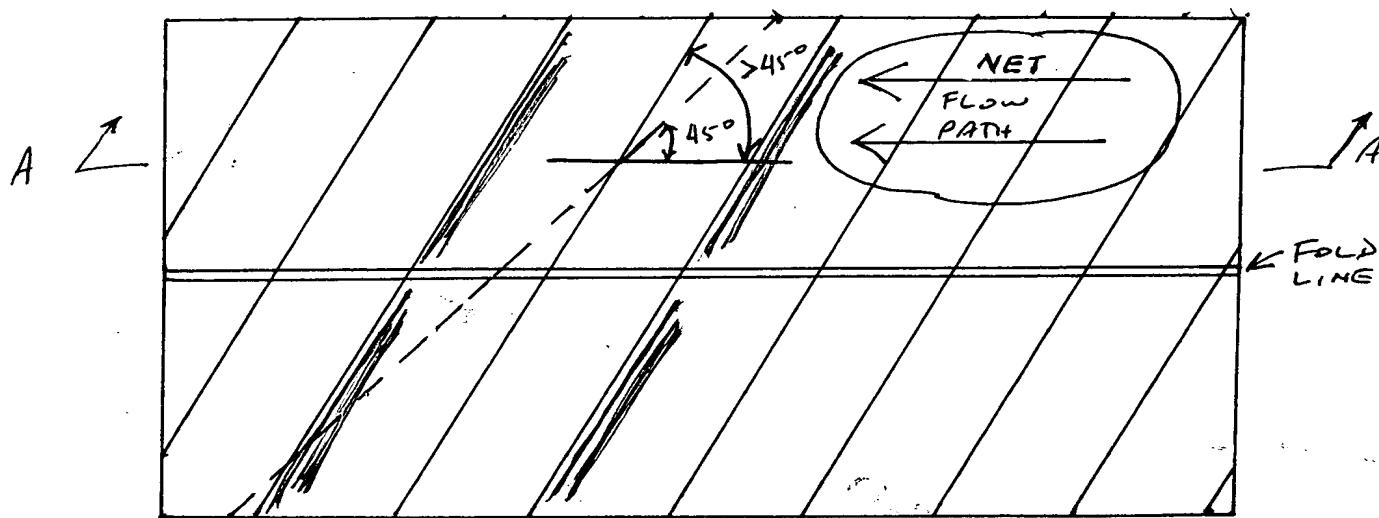


FIG. 5

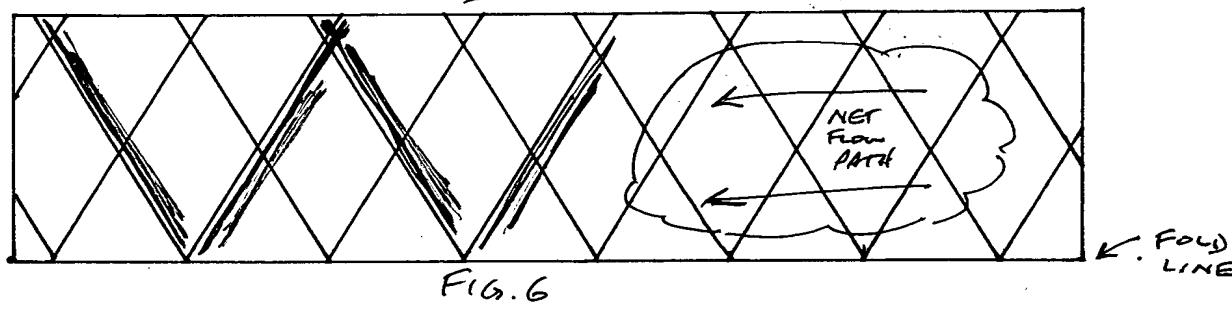


FIG. 6



A-A FIG. 7



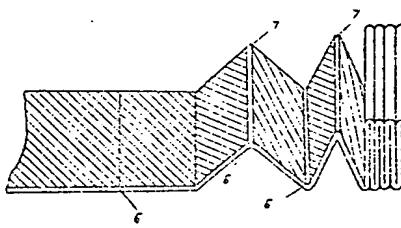
79230 D/43 A88 J08 Q74 Q78 AIRC = 03.10.78  
AIR COND VENTIL \*SU -800-500  
03.10.78-SU-694235 (10.02.81) F24f-03/08 F28d-09  
Air conditioning system heat utiliser - has checker in form of concertina of zigzag paper strip impregnated with thermoplastic resins

03.10.78 as 694235 (18MI)  
The heat utiliser comprises a body with inlets and outlets containing a checker. For efficient heat utilisation, the checker (6) is in the form of a concertina of zigzag-folded paper strip impregnated with thermoplastic resins. The bend lines (7) are directed towards the inlets and outlets.

This made made by putting the checker in the body. The paper strip as described above is made by partial polycondensation of the resins, impregnated with solvent on cross-lines and then bent on these lines to form the concertina. The resins are then fully condensed. Bul.4/30.1.81. (3pp Dwg.No.2)

A(12-B3, 12-H, 12-R2) J(7-A7)

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# О П И С А Н И Е ИЗОБРЕТЕНИЯ

№800500

## К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

(61) Дополнительное к авт. свид-ву -

(22) Заявлено 03.10.78 (21) 2694235/24-06

с присоединением заявки № -

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(54) УТИЛИЗАТОР ТЕПЛА И СПОСОБ ЕГО ИЗГОТОВЛЕНИЯ

Изобретение относится к технике кондиционирования воздуха, конкретно, к утилизации тепла.

Известны утилизаторы тепла преимущественно для систем кондиционирования воздуха, содержащие корпус с подводящими и отводящими патрубками и размещенную внутри него насадку [1].

Недостатками известного устройства утилизатора являются недостаточно высокая интенсивность процесса утилизации тепла и невозможность утилизации влаги.

Цель изобретения - повышение эффективности утилизации тепла.

Цель достигается тем, что насадка выполнена в виде гармошки из косогофрированной бумажной ленты, пропитанной термопластичными смолами, причем линии сгибов гармошки направлены в сторону подводящих и отводящих патрубков.

Утилизатор может быть изготовлен новым способом, заключающимся в том, что в качестве насадки выбирают бумажную ленту, пропитанную термопластичными смолами, осуществляют частичную поликонденсацию смол, смачивают ее растворителем по попереч-

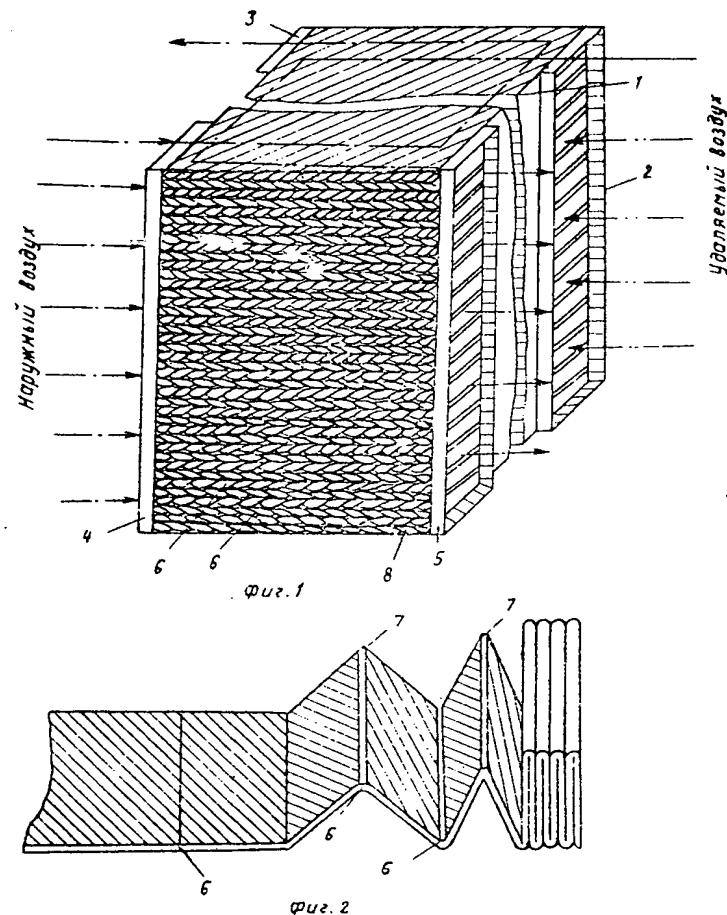
ным линиям, затем по этим линиям ленту сгибают в виде гармошки, после чего производят полную поликонденсацию смол.

На фиг. 1 изображен предлагаемый утилизатор тепла; на фиг. 2 - насадка.

Утилизатор содержит корпус 1 с подводящими 2 и отводящими 3 патрубками удаляемого воздуха, и подводящими 4 и стводящими 5 патрубками наружного воздуха. Внутри корпуса 1 размещена насадка 6 в виде гармошки из косогофрированной бумажной ленты, пропитанной термопластичными смолами, причем линии 7 сгибов гармошки направлены в сторону подводящих и отводящих патрубков.

Устройство работает следующим образом.

Для сохранения жесткости гофр термопластичные смолы в бумажной ленте должны быть полностью поликонденсированы, но из-за хрупкости бумажной ленты сгибание в гармошку невозможно. Чтобы избежать поломки ленты при ее сгибании в гармошку и при этом сохранить форму гофр, гофрируют бумажную ленту с одновременной частичной конденсацией про-



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C-35620

SPECIFICATION OF INVENTION  
TO INVENTOR'S CERTIFICATE

(11) 800500

USSR State	(22) Filed 3 October 1978 (21) 2694235/24-06 (51) IPC <sup>3</sup>
Committee on Inventions and Discoveries	(23) Priority - Published 30 January 1981 Bull. No. 4 (53) UDC 621.565.
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	10 February 1981 .2(088.8)
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(54) HEAT RECOVERY APPARATUS AND METHOD  
FOR PRODUCTION THEREOF

The invention relates to the field of air conditioning, concretely, to heat recovery.

Heat recovery apparatuses are known for primarily air conditioning systems, the apparatuses comprises a body with inlet and outlet pipes and a nozzle inside it [1].

Drawbacks of the known recovery apparatus are insufficiently high intensity of the heat recovery process and the fact that it is not possible to recover moisture.

The object of the invention is to enhance the effectiveness of heat recovery.

The object is achieved in that a nozzle is made in the form of an accordion-like bellows of skewed corrugated paper band impregnated with thermoplastic resins, wherein the crease lines of the bellows are directed toward the inlet and outlet pipes.

The recovery apparatus may be made by a new method consisting in that a paper band impregnated with thermoplastic resins is used as the nozzle, partial polycondensation of the resin is carried out, it is moistened with solvents along transverse lines, then the band is bent in the form of an accordion-like bellows along those lines, after which complete polycondensation of the resin is carried out.

Fig. 1 shows the proposed heat recovery apparatus, Fig. 2 shows the nozzle.

The recovery apparatus comprises a body 1 with inlet pipes 2 and outlet pipes 3 for the air to be removed, and inlet pipes 4 and outlet pipes 5 for outside air. A nozzle 6 in the

form of an accordion-like bellows of skewed corrugated paper band impregnated with thermoplastic resins is placed inside the body 1. Wherein crease lines 7 of the bellows are directed towards the inlet and outlet pipes.

The apparatus operates in the following manner.

In order to maintain rigidity of the corrugations, the thermoplastic resins in the paper band should be completely polycondensed, but due to the fragility of the paper band it is not possible to bend it into an accordion-like bellows. In order to avoid breaks in the band when it is being bent into the accordion-like bellows and at the same time retain the shape of the corrugations, the paper band is corrugated while simultaneously partially condensing the thermoplastic resins impregnating it. The crease lines 7 of the band are moistened with a solvent of the thermoplastic resins impregnating it. Wherein the resins on the crease lines are dissolved and thus the paper band along these lines becomes plastic, the skewed corrugated paper band is bent along the crease lines 7 into an accordion-like bellows, forming a nozzle, after which the nozzle assembly is subjected to heat treatment to complete polycondensation of the resins impregnating the paper.

The nozzle is put in the body 1 without clearance with its side walls, the crease lines 7 of the band directed toward the inlet 2 and 4 and the outlet 3 and 5 pipes for the air to be removed and the outside air. Wherein, cavities for the flow of air are formed from intersecting channels, closed by the side walls of the body 1, by the crease lines 7 of the skewed corrugated paper band, open towards the inlet and outlet pipes.

The air to be removed through the inlet pipe 2 enters the nozzle 6 and, passing through the cavities formed by the intersecting channels, is discharged through the outlet pipe 3. The outside air passes similarly through the pipes 4 and 5, but through adjacent cavities of the nozzle 6, limited by the plates of the skewed corrugated band.

When there is the simultaneous passage of flows of the air to be removed and the outside air through the plates of the skewed corrugated paper band, heat and moisture are transferred from one flow to the other as a result of the thermal conductivity and hygroscopicity of the paper band. The transfer of heat and moisture is intensified due to making the cavities for the passage of air from intersecting channels of the corrugated paper band, in which channels the air flows are constantly twisting.

Use of the proposed apparatus provides a positive effect, which is intensification of the process of heat recovery, and also moisture recovery.

## SET OF CLAIMS

1. A heat recovery apparatus, primarily for an air conditioning system, the apparatus comprising a body with inlet and outlet pipes and a nozzle placed inside the body, characterized in that in order to enhance the effectiveness of heat recovery, the nozzle is made in form of an accordion-like bellows from a skewed corrugated paper band, impregnated with thermoplastic resins, wherein the crease lines of the bellows are directed towards the inlet and outlet pipes.

2. A method for production of a heat recovery apparatus according to claim 1 by placing a nozzle in a body of a recovery apparatus, characterized in that, a paper band impregnated with thermoplastic resins is selected as the nozzle, partial polycondensation of the resins is carried out, it is moistened with a solvent along transverse lines, then bent along those lines in the form of an accordion-like bellows, after which complete polycondensation of the resins is effected.

## Sources of Information

taken into account during the examination

1. "Heat recovery in air systems" - "Heat and Ventilating Engineer," Great Britain, 50, No. 593, 1977, pp. 10-14.